

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 06 SEP 2005

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| Applicant's or agent's file reference 62780A | | FOR FURTHER ACTION | | See Form PCT/PEA/416 |
| International application No. PCT/US2004/040695 | | International filing date (day/month/year) 03.12.2004 | Priority date (day/month/year) 04.12.2003 | |
| International Patent Classification (IPC) or national classification and IPC C08K5/00, C08L23/00, C08L23/08 | | | | |
| Applicant DOW GLOBAL TECHNOLOGIES INC. | | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 5 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | | |
| Date of submission of the demand 01.07.2005 | | Date of completion of this report 05.09.2005 | | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | | Authorized Officer Glomm, B Telephone No. +49 89 2399-7158 | | |



**INTERNATIONAL PRELIMINARY REPORT
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Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-5, 7-9

as originally filed

6, 6a

received on 04.07.2005 with letter of 01.07.2005

Claims, Numbers

1-13

received on 04.07.2005 with letter of 01.07.2005

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
☐ claims Nos.

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the said claims Nos.
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

- ☐ has not been furnished
☐ does not comply with the standard

the computer readable form

- ☐ has not been furnished
☐ does not comply with the standard

- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☒ See separate sheet for further details

**INTERNATIONAL PRELIMINARY REPORT
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | |
| | No: Claims | 1-14 |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | 1-14 |
| Industrial applicability (IA) | Yes: Claims | 1-14 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Cited documents:

- D1: WO 96/08532 A (UNIROYAL CHEMICAL COMPANY, INC) 21 March 1996 (1996-03-21)
- D2: US-A-5 260 371 (CHEN ET AL) 9 November 1993 (1993-11-09)
- D3: US-A-5 549 048 (GODFREY-PHILLIPS ET AL) 27 August 1996 (1996-08-27)
- D4: EP-A-0 538 509 (SUMITOMO CHEMICAL COMPANY, LIMITED) 28 April 1993 (1993-04-28)
- D5: DD 276 585 A3 (VEB ROHRKOMBINAT STAHL- UND WALZWERK RIESA,DD) 7 March 1990 (1990-03-07)
- D6: US-A-4 650 903 (SON ET AL) 17 March 1987 (1987-03-17)
- D7: US-A-4 579 900 (CHATTERJEE ET AL) 1 April 1986 (1986-04-01)
- D8: EP-A-0 101 785 (CANUSA COATING SYSTEMS LIMITED) 7 March 1984 (1984-03-07)
- D9: EP-A-0 077 948 (BASF AKTIENGESELLSCHAFT) 4 May 1983 (1983-05-04)
- D10: DE 29 46 954 A1 (EC ERDOELCHEMIE GMBH; EC ERDOELCHEMIE GMBH, 5000 KOELN, DE) 4 June 1981 (1981-06-04)
- D11: US-B1-6 642 313 (KAZAKOV ALEXEI ET AL) 4 November 2003 (2003-11-04)

1. Amendments (Art. 34, section 2 (b), second sentence PCT)

The new claim 1 violates the provisions of the Art. 34, section 2 (b), second sentence PCT, such being not allowable.

Especially, the newly introduced disclaimer bridging the new pages 10 and 11, respectively (" provided that ... are chosen such, that ...") differs as concerns especially the wording of the last line of said page 10 and the first two lines of said page 11 in a significant manner from the original wording in previous claim 4, last three lines, respectively, on which latter wording said amendment of claim 1 should be based. Consequently, said new disclaimer wording lacks any clear and unambiguous basis in the contents of the application papers as originally filed. Therefore, the new set of claims violates the provisions of the Art. 34, section 2 (b), second sentence PCT.

In the subsequent European regional phase, if any, the applicant is invited to file new claims which overcome the above objection and meet the requirements of the Art. 34, section 2 (b), second sentence PCT, in order to avoid refusal of the application in its entirety.

2. Novelty (Art. 33 (2) PCT)

Taking account of the above objection under the item 1, for the purpose of the assessment of novelty and inventiveness, the further preliminary international examination will be based on the previous set of claims 1 to 14 as originally filed.

Each of cited documents D1 to D11 discloses a pipe as specified in detail in present independent main claim 1 (for relevant passages, see the corresponding International Search Report).

The attention of the applicant is drawn especially to the fact, that the parameters and terms as specified in the present claims 1 to 3, 5 to 7, and 9 to 14,

respectively, appear to be implicitly disclosed by each of said documents D1 to D12 in view of the principles of the established official rules of practice. Implicit (or inherent) disclosure corresponds to the fact, that the claimed product is regarded as being anticipated actually by said prior art documents, even if the claimed parameters or terms as specified in the said present claims are not expressly mentioned therein, i.e., the parameters or terms are regarded as being actually present in the prior art embodiments, but simply not determined and/or mentioned expressly therein.

Consequently, each of said documents D1 to D11 anticipates the subject matter of present claim 1.

The same considerations also relate to the additional features of the following claims 2 to 14 when taking into account the full disclosure of each of said documents D1 to D11.

Therefore the subject matter of present application is not new in view of the disclosure of each of said documents D1 to D11.

3. Inventive Step (Art. 33 (3) PCT)

Providing an amended main claim which meets the requirements of Art. 33 (2) PCT, the applicant should relate the distinguishing feature to a surprising (unexpected) technical effect or make credible or plausible that the distinguishing feature is not derivable from the prior art teaching (Art. 33 (3) PCT).

4. Miscellaneous

The obscure parameters and terms as specified in the present claims 1 to 3, 5 to 7, and 9 to 14, respectively, appear to attempt a definition of the subject matter to be protected by means of the corresponding results to be achieved, rather than by means of clear and unambiguous technical features, such violating the Art. 6 PCT. Furthermore, the said parameters and terms do not represent clear and unambiguous technical features, but relative terms having no clear and unambiguous meaning among the average persons skilled in the art. The applicant therefore is invited to replace said objected parameters or terms by clear and unambiguous technical features based on suitable subclaims or relevant passages taken from the present description.

Present application includes totally 2 independent claims, i.e., 1 and 7, respectively. The attention of the applicant is drawn to the established official practice, that an application generally should not contain more than one independent claim in a particular category. Consequently, the present set of claims will lead to a refusal of the application in the subsequent, European regional stage, if any.

In order to improve the understanding and legibility of the application, in the European regional phase, if any, the applicant is invited to identify the documents D1 to D10 in the description additionally and briefly discuss the relevant background art disclosed therein.

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(SEPARATE SHEET)**

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When filing amendments, any undue extension of the scope of the application should be avoided.

dried and weighed and the percent solubility calculated from the difference between the weight of the powder before and after stirring.

The hydrolyzed product of the antioxidant should also be more than five percent soluble in a hexane solution at 20°C. To determine the solubility of the hydrolyzed product, the antioxidant is first hydrolyzed by dissolving the antioxidant in a solvent such as acetone or dioxane. Water is then added in an amount to provide a solution having five percent by weight water. This solution is then refluxed for seven days or until the material is completely hydrolyzed. The solution is then evaporated to recover the solid and the solubility of this material is determined as above.

An example of the first class of antioxidants suitable for use in the present invention is 3,3',3'',5,5',5''-hexa-tert-Butyl-.alpha.,.alpha.,.alpha.''- (mesitylene-2,4,6-triyl)tri-p-cresol (CAS 1709-70-2) commercially available as Irganox 1330 (Ciba Specialty Chemicals) or Ethanox 330 (Albemarle Corporation).

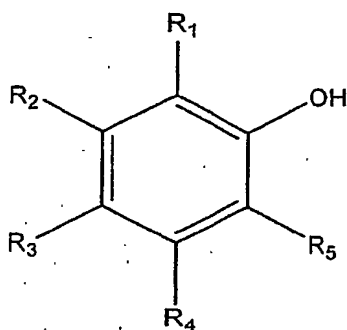
However, it was discovered that this first class of antioxidants is not as effective against chlorine and oxygen exposure as desired. For efficacy against chlorine exposure and oxygen in the air, a second class of antioxidants is preferred.

The second class of antioxidants corresponds to the same general formula as the first class wherein R_1 and R_5 can be $-\text{CH}_3$, $-\text{CH}(\text{CH}_3)_2$, or $-\text{C}(\text{CH}_3)_3$, and R_2 , R_3 , and R_4 can independently be hydrogen, or any hydrocarbon or substituted hydrocarbon group, provided that R_2 , R_3 and R_4 are chosen, such that the antioxidant does not contain the moiety $\text{Ph}-\text{CHR}_6-\text{Ph}$; or R_2 , R_3 and R_4 are chosen, such that the antioxidant does not contain the moiety $\text{Ph}-\text{CHR}_6-$; and where Ph represents a substituted or unsubstituted phenyl ring and R_6 can be H or a substituted or unsubstituted phenyl ring. Examples of the second class of antioxidants include Pentaerythritol Tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) (CAS 6683-19-8) available as Irganox 1010 (Ciba Specialty Chemicals); Octadecyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)-propionate (CAS 002082-79-3) available as Irganox 1076; 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazine-2,4,6(1H,3H,5H)-trione (CAS 2767-62-6) available as Irganox 3114; 1,3,5-TRIS(4-tert-butyl-3-hydroxy-2,6-dimethyl benzyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione (CAS 040601-76) available as Cyanox 1790 (CyTech Industries); Ethylenebis(oxyethylene)bis(3-(5-tert-butyl-4-hydroxy-m-tolyl)-propionate) (CAS 36443-68-2) available as Irganox 245; 1,6-Hexamethylene bis (3,5-di(tert)-butyl-4-hydroxyhydrocinnamate (CAS 35074-77-2) available as Irganox 259; Thiodiethylene bis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)

propionate] (CAS 41484-35-9) available as Irganox 1035; and mixtures thereof. The structures of antioxidants listed above are shown below.

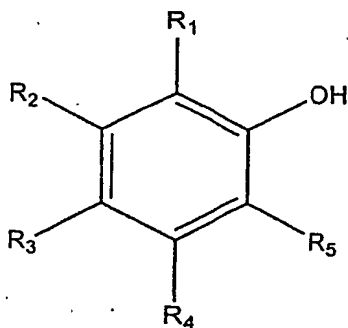
1. A pipe capable of obtaining an F time in Jana Laboratories Procedure APTF-2 of at least 1000 hours, under the following conditions: pH 6.8 (± 0.1); Chlorine 4.1 mg/L (± 0.1); Nominal ORP 830mV; fluid temperature 110°C (± 1); air temperature 110°C (± 1); pressure 70 psig (± 1); flow rate 0.1 US gallons/min (± 10 percent); said pipe comprising polyethylene having a density greater than about 0.925 g/cc, and wherein said pipe comprises an antioxidant system comprising two or more components, and wherein the antioxidant system includes at least one antioxidant from each of:

a) a first class of antioxidants comprising a hindered phenol corresponding to the formula:



wherein R_1 and R_5 can independently be $-\text{CH}_3$, $-\text{CH}(\text{CH}_3)_2$, or $-\text{C}(\text{CH}_3)_3$, and R_2 , R_3 , and R_4 can independently be H, or any hydrocarbon or substituted hydrocarbon group; and

b) a second class of antioxidants comprising a hindered phenol corresponding to the formula:



wherein R_1 and R_5 can be $-\text{CH}_3$, $-\text{CH}(\text{CH}_3)_2$, or $-\text{C}(\text{CH}_3)_3$, and R_2 , R_3 , and R_4 can independently be H, or any hydrocarbon or substituted hydrocarbon group, provided that R_2 , R_3 and R_4 are chosen, such that the antioxidant does not contain the moiety $\text{Ph}-\text{CHR}_6-\text{Ph}$; or R_2 , R_3 and R_4 are chosen, such that the antioxidant does not contain the moiety $\text{Ph}-\text{CHR}_6-$;

and wherein Ph represents a substituted or unsubstituted phenyl ring and R₆ can be H or a substituted or unsubstituted phenyl ring.

2. The pipe of Claim 1, wherein one of the antioxidant system components provides
5 extraction resistance and another provides oxidation resistance.

3. The pipe of Claim 1, wherein the antioxidant from the first class is characterized
as being more than five percent soluble in a hexane solution at 20°C, and further
characterized as having a hydrolyzed product that is more than five percent soluble in a
10 hexane solution at 20°C.

4. The pipe of Claim 3, wherein two or more antioxidants are selected from the
group consisting of Irganox 1010; Irganox 1330; and Irganox 1076.

15 5. The pipe of Claim 3, wherein the antioxidant system further comprises Irgafos
168.

6. The pipe of Claim 1, wherein the polyethylene resin comprises reactor grade
polyethylene, having a density greater than about 0.925 g/cc, and said pipe is capable of
20 obtaining an F time in Jana Laboratories Procedure APTF-2 of at least 1200 hours.

7. The pipe of Claim 6, wherein the antioxidant from the first class is characterized
as being more than five percent soluble in a hexane solution at 20°C, and further
characterized as having a hydrolyzed product that is more than five percent soluble in a
25 hexane solution at 20°C.

8. The pipe of Claim 7, wherein the polyethylene is multimodal.

9. The pipe of Claim 7, wherein the density is greater than 0.940 g/cc.
30

10. The pipe of Claim 7, wherein the polyethylene resin further comprises one or
more metal deactivators.

11. The pipe of Claim 7, wherein the polyethylene resin further comprises one or
35 more phosphorous based stabilizers.

12. The use of a pipe, as in Claim 7, for chlorinated hot water.
13. The pipe of Claim 1, in which the F time is greater than 1200 hours.